APPENDIX C

DISPERSANT EFFICACY AND AVAILABLE RESOURCES

C.1 Oils produced from California offshore platforms

Oil Field Name	Platform Name	Pacific Outer Continental Shelf Study	Minerals Management Service/EC Catalog	
		API Gravity	Name	API Gravity
Beta	Ellen Elly Eureka Edith	17.3 – 18.3	Beta	13.7
Carpinteria	Hogan Houchin Henry	24.2	Carpinteria	22.9
Dos Cuadras	Hillhouse A B C	24.3	Dos Cuadras	25.6
Hondo	Hondo Harmony	21.5	Hondo	19.6
Hueneme	Gina	20.9	Port Hueneme	
Pescado	Heritage	21.5		
Pitas Point	Habitat		Pitas Point	38
Point Arguello	Hidalgo Harvest Hermosa	22.2	Point Arguello Commingled Point Arguello Heavy Point Arguello Light	21.4 18.2 30.3
Point Pedernales	Irene	21.1	Platform Irene	11.2
Sacate				
Santa Clara	Gilda Grace	20.9	Santa Clara	22.1
Sockeye	Gail	21.6	Sockeye Sockeye Commingled Sockeye Sour Sockeye Sweet	26.2 19.8 18.8 29.4
			Platform Holly	11

From S.L. Ross, 2002

C.2 Some fresh oil properties of top ten oils shipped to California by tank ship, 1999-2001

Oil Type	Identifying Properties			
	API gravity	Sulfur content (%)	Viscosity at 15º C, cP	Pour point, ºC
Alaska North Slope	26.8	1.15	17	-15
Arab Medium	30.8	2.4	29	-10
Maya	21.8	3.3	299	-20
Arabian Light	33.4	1.77	14	-53
Oriente	29.2	1.01	85	-4
Basrah Light	33.7	1.95	20	-15
Escalante/Canadon Seco	24.1	0.19	?	?
Arabian Extra Light	37.9	1.2	?	?
FAO Blend	31.0	3.0	?	?
Yemen	31.0	0.6	?	?

C.3 Pacific OCS and imported California oils that have undergone spill-related testing and modeling

Crude oil name	API gravity	Fresh oil pour point (ºC)	Oil viscosity @ 15 ºC at various weathered states			Emulsion formation tendency	Dispersant "Window of Opportunity"
HIGHLY EMULSIFIABLE OILS (Emulsion forms at 0 to 10% oil evaporation)							
Arab Medium	29.5	-10	29	91	275	Yes @ 0%	Very narrow
Arab Light	31.8	-53	14	33	94	Yes @ 0%	Narrow
Hondo	19.6	-15	735	9583	449700	Yes @ 0%	Very narrow
Hueneme	14.8	-9	4131	20990		Yes @ 0%	Very narrow
Maya	21.8	-20	299	99390		Yes @ 0%	Very narrow
Oriente	25.9	-4	85		6124	Yes @ 0%	Very narrow
Pt. Arguello Commingled	21.4	-12	533	41860	2266000	Yes @ 0%	Very narrow
Pt. Arguello Heavy	18.2	-4	3250		4953000	Yes @ 0%	Very narrow
Pt. Arguello Light	30.3	-22	22	183	671	Yes @ 0%	Very narrow
Santa Clara	22.1	-3	304	1859	22760	Yes @ 0%	Very narrow
Sockeye	26.2	-12	45	163	628	Yes @ 0%	Very narrow
Sockeye Sour	18.8	-22	821	8708	475200	Yes @ 0%	Very narrow
MEDIUM EMULSIFIABLE OILS (Emulsion forms at 11 to 29% oil evaporation)							
Alaska North slope	26.8	-15	17	110	650	Yes @ 26%	Narrow
Carpinteria	22.9	-21	164	3426		Yes @ 11%	Narrow
Dos Cuadras	25.6	-30	51	187	741	Yes @ 11%	Narrow
Sockeye Sweet	29.4	-20	20	39	321	Yes @ 17%	Narrow
OILS THAT DO NOT EMULSIFY							
Diesel	39.5	-30	8	25	100	No	Very wide
Pitas Point	38.0	<-60	2		2	No	Very wide

Crude oil name	Hours for oil to reach specified viscosity in 10 kt winds and 15ºC water temperature					
	(Modeled) 1000 barrel batch spill (*i.e.*, from tank ship)			(Modeled) 10,000 barrel batch spill (*i.e.*, from tank ship)		
	2000 cP	5000 cP	20,000 cP	2000 cP	5000 cP	20,000 cP
HIGHLY EMULSIFIABLE OILS (Emulsion forms at 0 to 10% oil evaporation)						
Arab Medium	4.2	6.4	22.0	4.9	7.7	39.0
Arab Light	10.0	36.0	Disp @ 41 hrs	13.3	68.8	Disp @ 68 hrs
Hondo	2.0	3.0	5.5	2.4	3.7	6.2
Hueneme	0.0	0.5	1.9	0.0	0.5	1.9
Maya	1.6	2.3	4.8	1.8	2.6	5.1
Oriente	2.2	3.2	5.2	2.8	3.8	6.4
Pt. Arguello Commingled	1.6	2.6	4.3	1.7	2.9	4.9
Pt. Arguello Heavy	0.0	0.5	1.7	0.0	0.5	1.9
Pt. Arguello Light	4.4	6.9	23.0	5.1	8.1	42.0
Santa Clara	2.6	3.8	6.6	2.9	4.4	7.9
Sockeye	3.9	5.6	13.2	4.3	6.4	20.4
Sockeye Sour	1.1	1.9	3.1	1.3	2.0	3.5
MEDIUM EMULSIFIABLE OILS (Emulsion forms at 11 to 29% oil evaporation)						
Alaska North slope	37.9	39.7	43.3	60.7	62.2	66.7
Carpinteria	5.6	6.6	8.9	8.3	9.5	12.0
Dos Cuadras	5.4	7.0	11.0	7.4	8.9	14.3
Sockeye Sweet	8.6	10.6	28.8	11.6	14.1	47.8
OILS THAT DO NOT EMULSIFY						
Diesel	60.0	Disp @ 69 hrs		101.0	Disp @ 111 hrs	
Pitas Point	Disp @ 2.3 hrs			Disp @ 3.5 hrs		

The opportunity for using dispersants effectively on most oils listed above is limited. Only a few of the produced oils appear amenable to dispersion. However, if spill circumstances are right and response is very rapid, some success might be possible. The situation is different for the imported oils. Alaska North Slope crude, which represents about 50% of the oil spill risk from tankers in California, appears to be quite amenable to dispersion. Diesel oil, which is ubiquitous and therefore tends to be spilled relatively frequently, is also a good candidate.

From S.L. Ross, 2002

C.4 Description of general oil characteristics based on oil type

Type	Description	Characteristics	Crude oil examples	Refined product examples
I	**Light distillates** No need to disperse; oil will dissipate rapidly**.**	Specific gravity: <0.80 API gravity: >45 Viscosity: 0.5-2.0 cSt @ 15º C Non-persistent, very volatile, highly flammable, high evaporation rates, rapid spreading rates, highly toxic to biota, little if any emulsification, high penetration of substrate.	Algerian blend	Maui and Kapuni distillate, gasoline blendstocks, motor spirit (RMS/PMS), Avgas, Jet A1, kerosene
II	**Light crudes** Relatively non-persistent. Easily dispersed if pour point under 41º F; probably difficult to disperse if water temperature is below pour point (behaves like a Group IV oil).	Specific gravity: 0.80-0.85 API gravity: 35-45 Viscosity: 4 cSt to solid @ 15º C Non-persistent, moderate to high volatility, low to moderate viscosity, moderate to high toxicity, can form stable emulsions, moderate to high penetration of substrates.	Pour point <41º F: Brent, Ekofisk, Forties, Murban, Seria Light Pour point >41º F: Ardjuna, Beatrice, Camar, Lucina, Palanca, Angola, Pennington	Unfinished oils; automotive gas oil, marine gas oil, Navy gas oil
III	**Medium – heavy crudes, fuel oils** Fairly persistent, easily dispersed if treated promptly.	Specific gravity: 0.80-0.95 API gravity: 17.5-35 Viscosity: 8 cSt to solid @ 15º C Persistent, moderate volatility, moderate viscosity, variable acute toxicity, can form stable emulsions, low to moderate penetration of substrates.	Pour point < 41º F: Alaskan, Arabian light, Basrah, Dubai, Iranian heavy, Kuwaiti, Maya, Oriente Pour point > 41º F: Bonny light, Coban blend, Gamba, LSWR, Minas, Santa Cruz, Taching, Zaire	
IV	**Heavy crudes and residues** Fairly persistent, probably difficult to disperse if water temperature is below pour point of material.	Specific gravity: 0.9501.00 API gravity: 10.0-17.5 Viscosity: 1500 cSt to solid @ 15º C Persistent, low to moderate volatility, moderate to high viscosity, variable acute toxicity, can form stable emulsions, low to moderate penetration of substrates.		Heavy fuel oil, residues, Fletcher blend, Maui F sands < pour point, lube oils, lube oil blendstocks
V	**Non-spreading oils** Persistent, generally not dispersible	Specific gravity: >1.00 API gravity: <10.0 Viscosity: Solid unless heated Persistent, very low volatility, little if any evaporation, very high viscosity, very low acute toxicity, can form stable emulsions, little if any penetration of substrate.		Heavy bunker fuel oil, bitumen, very heavy fuel oil, asphalt, paraffins, waxes, residual fuels

In part from Cawthron, 2000

C.5 General California dispersant application platform information

Application method	Weather limitations	Advantages	Disadvantages
C-130/ADDS Pack	Winds: 30 – 35 kts Waves: 17 – 23 ft	Suitable for very large spills with longer (several day) time windows to accommodate the minimum 24-hour startup time. Greatest delivery capacity; might be capable of fully treating all of the oil spilled in a blowout spill and all oil in a 10,000 bbl batch spill.	At present the nearest ADDS Pack units are outside the state; start-up times may be lengthy; spraying not likely to begin until the second day of the spill; very expensive; requires runway.
DC-4		Suitable for very large spills with longer (several day) time windows to accommodate the minimum 24-hour startup time. The platform modeled is owned by Airborne Support Incorporated of Houma, LA; delivery capacity is approximately one-half that of the C-130 ADDS Pack.	Earliest this aircraft can begin spraying dispersant in California is probably the morning of the second day.
Single-engine planes (*e.g*., Cessna AT-802 "Agtruck")	Winds: 17 – 21 kts Waves: 6 – 9 ft Ceiling: ≥1000 ft Visibility: ≥ 3 nm	Suitable for small- to mid-sized spills that occur at considerable distance from the response centers provided the time window is long enough to accommodate their slower startup time. Purpose-built for aerial spraying; capable of fairly short start-up time; a number of Agtrucks available for use in a large spill; other small planes may be relatively inexpensive.	Smaller payload; more limited range; not yet available in California, although one AZ operator may be under contract to CA OSRO; platform may not be available until beginning of the second day; limited to smaller spills; uses neat dispersant only
Medium-size helicopter	Winds: 17 – 27 kts Waves: 6 – 17 feet	Available; highly maneuverable; capable of being re-supplied near spill site; good operational efficiency; lands almost anywhere. Above sea blowouts from oil platforms (of oils with a <u>medium</u> emulsification rate) are good candidates for treatment by ship and helicopter platforms because they can remain on-scene and deliver dispersants constantly when needed. May be adequate to deal with small tanker spills close to their re-supply bases; could also respond to mid-sized spills provided the time window is long enough.	Limited by small payload and range; two are available in southern CA; use neat dispersant only. Blowouts of high emulsification rate oils will <u>not</u> be good candidates for dispersion from any platform type. Ship-based delivery may be limited by slow transit speed and small payload. These platforms are limited for spills at a distance from their base of operations, either because of slow transit speed or limited operating range. These limitations can be overcome in some circumstances by re-supplying them at or near the spill site.
Work boat	Winds: 7 – 21 kts Waves: 1 – 9 feet	Good control; mixes water. Above-sea blowouts from oil platforms (of oils with a <u>medium</u> emulsification rate) are good candidates for treatment by ship and helicopter platforms because they can remain on-scene and deliver dispersants constantly when needed. May be adequate to deal with small tanker spills close to their re-supply bases; could also respond to mid-sized spills provided the time window is long enough.	Moderate transit speed; only two ship-based systems (high-speed crew-cargo vessels) available in CA; limited to small spills; limited swath width. Blowouts of high emulsification rate oils will <u>not</u> be good candidates for dispersion from any platform type. Ship-based delivery may be limited by slow transit speed and small payload. These platforms are limited for spills at a distance from their base of operations, either because of slow transit speed or limited operating range. These limitations can be overcome in some circumstances by re-supplying them at or near the spill site.

From S.L. Ross, 2002

C.6 Characteristics of dispersant spraying platforms available to operators in California

Application system	Payload (gallons)	Pump rate (gpm)	Swath width (feet)	Average transit speed (knots)	Average				
					Start-up time (hours)	Spray speed (knots)	Repositioning time (minutes)	Resupply time (hours)	Range
C-130/ADDS-pack	5500	600	100	214	24	140	2	1	7 hours
DC-4 [a]	2000-2500	500	100	214	1	157	2	1	
Agtruck AT-802	800	120	80	200	4	140	0.5	1	200 miles
Agtruck AT-502	500	120	80	200	4	140	0.5	1	200 miles
Helicopter	150	79	80	90	1	50	0.5	0.25	1.75 miles
Vessel A [b]	1000	10	120	7	1	7	2	1	
Vessel D [c]	20,000	60	175	25	1	25	2	1	

[a] Values reported in the literature for aircraft logistic characteristics such as payload are somewhat variable. For the DC-4 payload, values range from 2000 to 2500 gallons. The value used in calculations is at the upper end of this range, 2500 gallons. It must be recognized that the payload of the existing DC-4 platform in the Gulf of Mexico area is somewhat lower than this at 2000 gallons.

[b] Modeled after Clean Seas boom type vessel spray system.

[c] Modeled after new portable single-nozzle spray system developed by National Response Corporation (NRC) and mounted on one of NRC's crew-cargo vessels. System characteristics are as follows:

- Payload: capacity is up to 20,000 gallons in the form of up to 10 2000-gallon DOT marine-portable tanks
- Pump rates: variable at 12, 25, 40 and 60 gallons per minute
- Swath width: range of nozzle varies with pump rate up to 70 feet @ 60 gpm, with one system on each side. Allowing for the 35' beam of the vessel, swath width is 140'
- Vessel speed: maximum speed is 25 knots

From S.L. Ross, 2002

C.7 Dispersant spraying capacity of platforms as a function of distance [a]

Platform	Operating distance (miles)	Number of sorties per day	Payload (barrels)	Volume of dispersant sprayed per day (barrels)	Volume of oil dispersed per day (barrels) [b]
C-130/ADDS Pack [c]	10	4	130.8	523.2	10464
	30	4	130.8	523.2	10464
	100	3	130.8	39234	7848
	200	3	130.8	392.4	7848
DC-4 [d]	10	6	47.6	285.6	5712
	30	5	47.6	238.1	4761
	100	4	47.6	190.4	3808
	200	3	47.6	142.8	2856
AT-802	10	8	18.9	151.2	3024
	30	7	18.9	132.1	2642
	100	5	18.9	94.4	1887
	200	3	18.9	56.6	1132
Helicopter	1	30	5.7	169.8	3396
	10	21	5.7	119.7	2394
	30	11	5.7	62.3	1245
Vessel [e]	1	3	23.8	71.4	1428
	10	2	23.8	47.6	952
	30	1	23.8	23.8	476
	100	1	23.8	23.8	476

[a] Based on response to a batch spill of 3180 m^3 (20,000 barrels).
[b] Assuming 20 volumes of oil are dispersed per 1 volume of dispersant sprayed.
[c] ADDS Pack specifications as per Biegert Aviation: Maximum reservoir capacity = 5500 gallons (20.8 m^3 = 130.8), recommended capacity = 5500 gallons (18.9 m^3).
[d] Values reported in literature for payload of DC-4 range from 2000 to 2500 gallons (7.5 to 9.5 m^3); value used here is 2000 gallons (= 47.6 barrels) as per ASI, Houma, LA.
[e] Modeled after Clean Seas boom type vessel spray system.

From S.L. Ross, 2002

C.8 Stockpiles of dispersant application resources in California and North America

Organization	Equipment types	Type of dispersant	Dispersant storage location	Quantity of dispersant (gallons)
Within California [a]				
Marine Spill Response Cooperative [b] 2070 Commerce Avenue Concord, CA 94520 Contact: Steve Ricks Phone: 925-685-2800		Corexit 9527	Concord, CA	15,015
Clean Seas Cooperative [c] 1180 Eugenia Place, Suite 204 Carpinteria, CA 93013 24-hr phone: 805-684-3838 Contacts: Merrill Jacobs Phone: 805-684-4811 Jim Caesar Phone: 805-684-4392	Boats Mr. Clean & Mr. Clean III: 1000 gallons Corexit 9527 on board each vessel. Swath width for Mr. Clean is 105 ft, for Mr. Clean III is 115 ft; vessel calibration and dosage rate vary from speeds of 3 to 10 knots and dosage rates from 2 – 10 gal/acre. Aerial (helicopter) Storage 150 gal max; pumping rate 50 – 100 gal per minute; boom length 32 ft, swath 50 – 60 ft depending on speed; speed 50 – 100 kts; dosage rate 2, 3 or 5 gal per acre. Yard Inventory (Corexit 9527) (2) 5000 gal tankers = 10,000 (13) 550 gal tanks = 7150 (20) 55 gal barrels = 1100 (1) 500 gal tank = 500 Clean Seas also has 880 gals of shoreline dispersant (Corexit 7664) stored at yard.	Corexit 9527	Carpinteria, CA	20,750

C.8, continued Stockpiles of dispersants application resources in California and North America

Organization	Equipment types	Type of dispersant	Dispersant storage location	Quantity of dispersant (gallons)
Marine Spill Response Cooperative [d] 190 South Pico Avenue Long Beach, CA 90802-6247 Contacts: Ray Nottingham Phone: 562-432-1415 ext. 222 Dave Redmond Phone: 562-432-1415	Aerial Contract with Emergency Aerial Dispersant Consortium (EADC) for an Air Tractor 802 (crop duster type airplane). Arizona to Long Beach response time of 6 hours after notification. AT 502 on backup through EADC if needed. AT 802 holds approximately 800 gallons of dispersant. Can deploy full load of dispersant within approximately 15 minutes. CCW stores Corexit 9527 in their Long Beach yard in 350 gallon totes for easier storage and transport.	Corexit 9527		6,545
Other North American Dispersant Stockpiles [e]				
Alyeska Pipeline Service Company P.O. Box 196660 Anchorage, AK 99519-6660 Phone: 907-278-1611		Corexit 9527 Corexit 9527	Anchorage, AK Valdez, AK	56,000 4,000
Clean Islands Council/State of Hawaii 179 Sand Islands Access Road Honolulu, HI 96819 Phone: 808-845-8465		Corexit 9527 Corexit 9500	Honolulu, HI Honolulu, HI	3,080 34,180
Clean Caribbean Cooperative 2381 Stirling Road Fort Lauderdale, FL 33312 Phone: 954-983-9880		Corexit 9527 Corexit 9500	Pt. Everglades, FL Pt. Everglades, FL	4,070 25,300
LOOP, Inc. 1 Seine Court New Orleans, LA 70114 Phone: 504-368-5667		Corexit 9527	Houma, LA	33,600
Clean Gulf Associates 1450 Poydras Street, Suite 1625 New Orleans, LA 70112 Phone: 888-242-2007		Corexit 9527 Corexit 9500	Houma LA Sugarland, TX	5,665 28,985
Marine Spill Response Corporation 120 Fieldcrest Avenue Edison, NJ 08837 Phone: 732-417-0500		Corexit 9527	Lyndon, NJ	24,640
CISPRI (CIRO) 1392 Ocean Drive Homer, AK 99603 Phone: 907-235-6785		Corexit 9527 Corexit 9527	Niski, AK Anchorage, AK	9,295 11,275

C.8, continued Stockpiles of dispersants application resources in California and North America

Organization	Equipment types	Type of dispersant	Dispersant storage location	Quantity of dispersant (gallons)
Marine Spill Response Corporation **Clean Gulf Associates** 396 Roland Road Houma, LA 70363 Phone: 985-580-0924		Corexit 9527	Houma, LA	16,000
Airborne Support, Inc. 3626 Thunderbird Road Houma, LA 70363 Phone: 985-851-6391		Corexit 9527 Corexit 9500	Houma, LA Houma, LA	2,000 4,470
National Response Corporation 11200 Westheimer Road Houston, TX 77042 Phone: 713-977-9951 Houston, TX		Corexit 9527 Corexit 9500	Cameron, LA Morgan City, LA	1,540 220
Clean Sound Cooperative 1105 13th Street Everett, WA 98201 Phone: 425-783-0908		Corexit 9527	Blaine, WA	6,270
Delaware Bay & River Cooperative 700 Pilottown Road Lewes, DE 19958 Phone: 302-645-7861		Corexit 9527	Slaughter Beach, DE	1,650
Clean Harbors Cooperative 4601 Tremley Point Road Linden, NJ 07036 Phone: 908-862-7500		Corexit 9527	Lyndon, NJ	1,375
Nalco Exxon Energy Chemicals Hwy 42 North Kilgore, TX 75662 Phone: 903-984-1695		Corexit 9527 Corexit 9500	Sugarland, TX Sugarland, TX	Producer

[a] The amount of dispersant currently (2003) available in California is 42,310 gallons (1007 barrels), sufficient to treat 20,140 barrels of oil, assuming a 1:20 (dispersant:water) dilution ratio.

[b] Email communication, Steve Ricks (Clean Bay) to Ellen Faurot-Daniels (California Coastal Commission), 12/12/03.

[c] Email communication, Jim Caesar (Clean Seas) to Ellen Faurot-Daniels (California Coastal Commission), 11/25/03.

[d] mail communication, Ray Nottingham (Clean Coastal Waters) to Ellen Faurot-Daniels (California Coastal Commission), 12/02/03.

[e] Substantively from S.L. Ross, 2002. North American stockpile values are approximate because quantities change constantly. A portion of the 273,615 gallons (6514 bbls) could be made available for use on spills in California. Assuming a 1:20 dilution ratio, this quantity is sufficient for a spill of approximately 150,000 barrels.

Updated from Cawthron, 2000

C.9 Manufacturers of dispersant spray systems for boats, helicopters and fixed-wing aircraft

Dispersant spray equipment for boats, helicopters and fixed-wing aircraft are available from various manufacturers throughout the world. Table C.9 is a partial representative listing. Publications such as the *International Oil Spill Control Directory* and the *World Catalog of Oil Spill Response Products* have more complete listings that are periodically updated.

Dispersant application systems differ in design, capability, versatility, size, weight, ease of handling and control of dosage. Their suitability depends in part on the type of dispersant used. Concentrated dispersants such as Corexit 9500 and Corexit 9527 are generally most appropriate for modern spray equipment. A detailed description of application equipment requirements is presented in the 1997/1998 *World Catalog of Oil Spill Response Products*.

	Boats	Helicopters	Fixed-wing aircraft
ABASCO 363 West Canino Houston, Texas 77037 Phone: 800-242-7745	X	X	X
Ayles Fernie International, Ltd. Unit D5 Chaucer Business Park Kemsing, Seven Oaks, Kent TN15 6YU England Phone: 44/1732762962	X		
Biegert Aviation, Inc. 22022 South Price Road Chandler, Arizona 85245 Phone: 602-796-2400			X
CECA S.A. (Subsidiary of Elf Aquitane Group) Avenue Alfred Nobel – 64000 PAU France Phone: 33/559 92 44 00	X		
Helitask Bourne Airfield Cambridge CB3 7TQ England Phone: 44/954-210-765		X	
KU-SINTEF Group S.P. Andersens vei 15b N-7034 Trondheim, Norway Phone: 47 73 59 11 00		X	
KOLDA Corporation 16770 Hedgecroft, Suite 708 Houston, Texas 77060 Phone: 281-448-8995	X		X

C.9, continued Manufacturers of dispersant spray systems for boats, helicopters and fixed-wing aircraft

	Boats	Helicopters	Fixed-wing aircraft
KAAF Agro Aviation Les Jasses D'Albaron 13123 Albaror Arles, France Phone: 33/9071188		X	
Kepner Plastic Fabricators, Inc. 3131 Lomita Blvd. Torrance, California 90505 Phone: 310-325-3162	X		
Ro-Clean Desmi 21B Hestehaven DK5260, Odense S. Denmark Phone 45-65-910-201	X		
Simplex Manufacturing Company 13340 NE Whitaker Way Portland, Oregon 97230 Phone: 503-257-3511		X	
Slickbar Products Corporation 18 Beach Street Seymour, Connecticut 06483 Phone: 203-888-7700	X		
Transland, Inc. 24511 Frampton Avenue Harbor City, California 90710 Phone: 310-534-2511	X		
Vikoma International Ltd. Prospect Road Cowes, Isle of Wight PO31 7AD, England		X	

From ExxonMobil, 2000